

Chapter 2. PROJECT DESCRIPTION

2.1 Project Objectives

The proposed project, as defined in the Final Environmental Document (FED) certified by the Commission on August 28, 1998, is the regulation of Pacific herring fisheries under the State's jurisdiction. The regulations are considered for inclusion in the California Code of Regulations (CCR) to implement the State's policies for managing the commercial use of Pacific herring (sections 163, 163.5, and 164, Title 14, CCR). The proposed project and alternatives addressed in this Draft Supplemental Environmental Document (DSED) take the form of recommendations for amendment or change to the existing body of regulations. The recommendations and alternatives are based on biological assessments of existing stock conditions and comments received from interested individuals, commercial fishermen, and from the Director's Herring Advisory Committee (DHAC). The California Fish and Game Commission (Commission) has legislatively-delegated authority to act on these recommendations.

The project goal is to maintain healthy Pacific herring stocks in California. Project objectives to achieve this goal include:

- € Restore healthy age structures to stocks in need of rebuilding;
- € Avoid the harvest of two and three-year-old herring, [could leave the 'why' part out]many of which are first-time spawners;
- € Manage commercial harvest of Pacific herring to achieve a sustainable fishery;
- € Provide sufficient Pacific herring to conserve living resources of the ocean that utilize herring as a food source;
- € Provide sufficient Pacific herring to support recreational take.

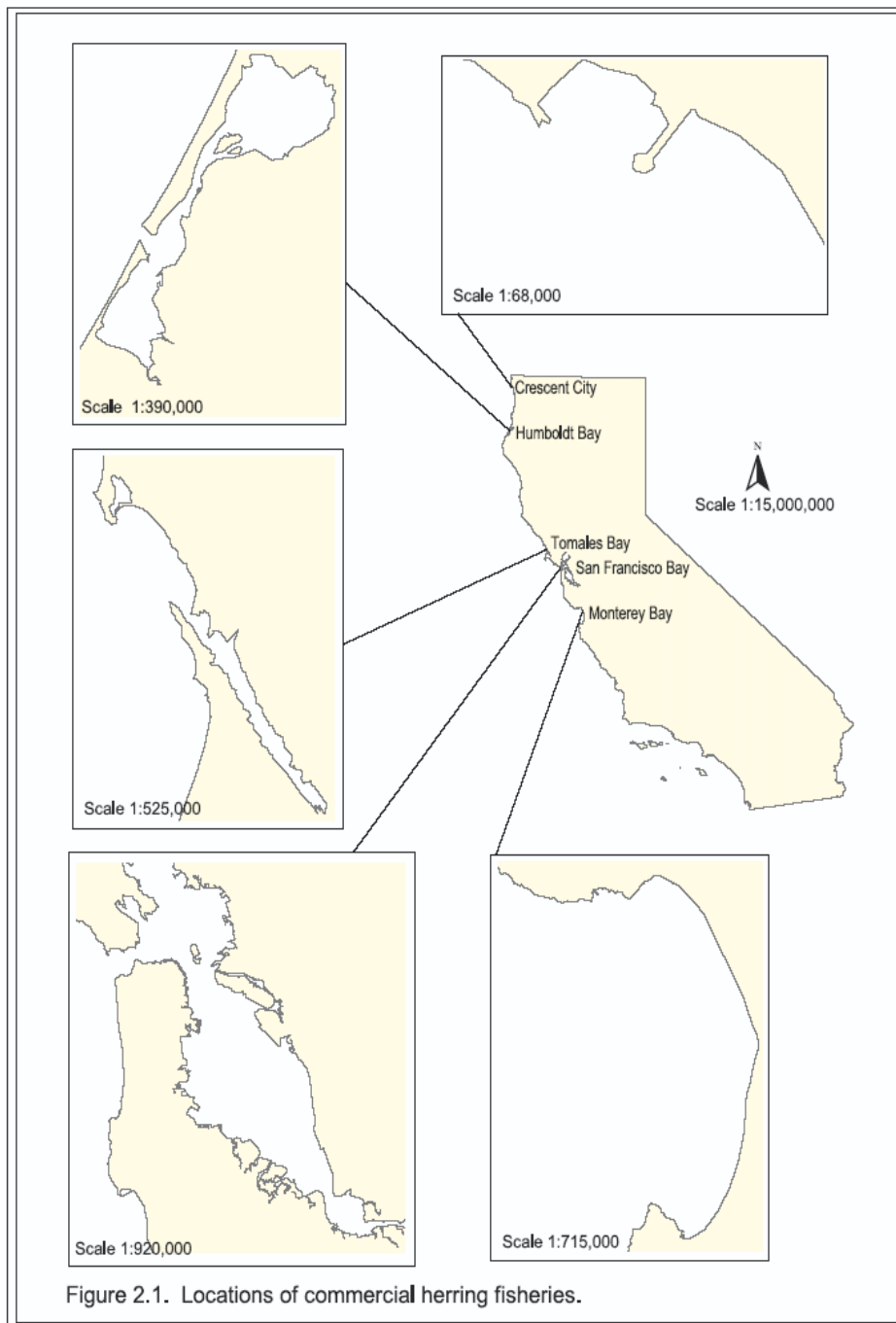
Under existing law, herring may be taken for commercial purposes only under a revocable permit, subject to such regulations as the Commission shall prescribe (Section 8550 California Fish and Game Code). Current regulations specify permit

qualifications, permit validation requirements, permit limitations, permit areas, seasons, fishing quotas, gear restrictions, and landing and monitoring requirements.

The proposed project addressed by this DSED consists of amendments and changes to existing regulations for the 2004-05 commercial herring fishing season. The proposed project adjusts fishing quotas by area and gear type. Quota recommendations for San Francisco Bay and Tomales Bay are primarily based on the most recent assessments by the Department of Fish and Game (Department) of the size of the spawning populations of herring in those areas. Other proposed amendments and changes are intended to improve the efficient and orderly conduct of herring fisheries and the management of herring stocks.

2.2 Project Locations

Permits have been issued for commercial herring fishing in five geographically distinct areas of the ocean and estuarine waters under the jurisdiction of the State of California (Figure 2.1). Many of the regulations considered by this document are specific to an area and type of fishing operation. This section describes each area in which regulatory changes are proposed, including current commercial fisheries for herring, and proposed seasons, quotas, and geographical restrictions for those fisheries. A complete description of commercial herring fishing areas is provided in Section 2.2 of the FED. The environmental setting for each geographical fishing area is detailed in Section 3.3 of the FED.



2.2.1 San Francisco Bay

The proposed commercial herring fishing dates and quotas by location are as follows:

2.2.1.1 Roe Herring Fishery

Season: 5:00 p.m. on Sunday December 11, 2005 until 6:00 a.m. on December 23, 2005; December 26, 2005 at 5:00 p.m. until December 30, 2005 at 6:00 a.m.; and January 2, 2006 at 5:00 p.m. until noon Friday March 17, 2006.

Note: Herring fishing is not permitted from noon on Friday through 5:00 p.m. on Sunday (Section 163 (h)(5), Title 14, CCR).

Gill net permittees (DH) December 11-16, December 18-23, December 25-30, and, if necessary, after other platoons have reached their quotas, until the DH quota is reached or the last day of the season.

Gill net permittees (Odd #) January 2-6, January 15-20, January 29-February 3, February 12-17, February 26-March 3, March 12-17.

Gill net permittees (Even #) January 8-13, January 22-27, February 5-10, February 19-24, March 5-10.

Quota: Option 1
A 5,890 ton quota if the minimum mesh size remains at 2 1/8 in.

Option 2
A 4,502 ton quota if the minimum mesh size is changed to 2-in.

Note: The overall quota for the herring roe fishery will be reduced by transfers to the herring eggs-on-kelp fishery, and the fresh fish market quota (See Section 2.2.1.2 and 2.2.1.3)

Area: Waters of Districts 12 and 13 and that portion of District 11 lying south of a line extending from Peninsula Point (the most southerly extremity of Belvedere Island) to the easternmost point of the Sausalito ferry dock.

1) Regulations prohibit the setting or operating of nets within 300 feet of the following piers and recreation areas: Berkeley Pier, Paradise Pier, and San Francisco Municipal Pier between the foot of Hyde Street and Van Ness Avenue, Pier 7 (San Francisco), Candlestick Point State Recreation Area, the jetties in Horseshoe Bay, and the fishing pier at Fort Baker. Regulations also prohibit the setting or operating of nets within 70 feet of Mission Rock Pier.

2) Regulations prohibit the setting or operating of nets in Belvedere Cove north of a line drawn from the tip of Peninsula Point to the tip of Elephant Rock. Regulations also prohibit the setting or operating of gill nets from November 15 through March 17 in the area bounded by a line drawn from the middle anchorage of the western section of the Oakland Bay Bridge (Tower C) to the Lash Terminal buoy #5 to the easternmost point at Hunter's Point (Point Avisadero), from Point Avisadero to the Y "A" buoy to Alameda NAS entrance buoy #1 (entrance to Alameda Carrier Channel) to the Oakland Harbor Bar Channel buoy #1, and then from the first Bar Channel buoy to Tower C of the Bay Bridge.

3) Other closures affecting the fishery include United States Coast Guard enforced Homeland Security Zones: 25 yards around all Golden Gate and Bay Bridge abutments and piers; 100 yards around and under any High Interest Vessels; and Naval Vessel Protection Zones which extend 100 yards around all Naval Vessels at all times and a 500 yard slow zone surrounding all Naval Vessels. The United States Coast Guard will also enforce Rule 9 of the Code of Federal Regulations (CFR) regarding channel and harbor blockages.

2.2.1.2 Herring Eggs-on-Kelp (HEOK) Fishery

Season: December 1, 2005 to March 31, 2006

Quota: Option 1

An individual quota of 3.0 tons for transferred gill net permits, and an individual quota of 10.4 tons for transferred "CH" permits.

Option 2

An individual quota of 2.3 tons for transferred gill net permits, and an individual quota of 7.9 tons for transferred "CH" permits.

Note: The combined quota for harvest of herring eggs on kelp depends on the number of "CH" and gill net permits transferred to the herring eggs on kelp fishery.

Area: Waters of Districts 11, 12, and 13, and that portion of District 2 known as Richardson Bay.

Note: The area open to the herring eggs-on-kelp fishery is further restricted. Rafts and lines may not be placed in any waters or areas otherwise closed or restricted to the use of herring gill net operations, except the areas known as Belvedere Cove and Richardson Bay or except where written permission is granted by the owners or controlling

agency (e.g., Navy, Coast Guard). When rafts or lines are placed in Belvedere Cove or Richardson Bay, they must be tied to a permanent structure (e.g., pier or dock).

2.2.1.3 Fresh Fish Market Fishery (not for roe purposes) San Francisco Bay

Season: November 2 through November 15, 2005 and April 1 through October 31, 2006.

Quota: 20 tons, except that 10 tons total may be transferred to gill net permittees participating in research sponsored by the Department.

Note: No permittee may take or possess herring except in the amount specified on a current daily market order, not to exceed 500 pounds, from a licensed fish dealer.

Area: Same as the roe herring fishery.

2.2.2 Tomales Bay

The proposed Department commercial herring fishing dates and quotas by location are as follows:

2.2.2.1 Roe Herring Fishery

Season: 5:00 p.m. on Sunday, December 25, 2005 until noon on Friday, December 30, 2005, and from 5:00 p.m. on Sunday, January 1, 2006, until noon on Friday, February 24, 2006.

Note: Herring fishing is not permitted from noon on Friday through 5:00 p.m. on Sunday (Section 163 (h)(5), Title 14, CCR. However, there is a proposal from Tomales Bay fishermen to allow fishing on the weekends (Section 2.3.1.4.1.)

Quota: The total take of herring for roe purposes shall not exceed 400 tons for the season. However, if spawning escapement reaches or exceeds 4,000 tons prior to February 15, 2006, the quota shall be increased as follows: 1) if the spawning escapement is more than 4,000 tons, the total take of herring shall not exceed 500 tons for the season.

Area: Tomales Bay includes the waters of District 10 lying south of a line drawn west 252° magnetic, from the western tip of Tom's Point to the opposite shore.

2.2.2.2 Fresh Fish Market Fishery (not for roe purposes) Tomales Bay

Season: November 2 through November 15, 2005 and April 1 through October 31, 2006.

Quota: 10 tons

Note: No permittee may take or possess herring except in the amount specified on a current daily market order, not to exceed 500 pounds, from a licensed fish dealer.

Area: Same as roe fishery.

2.3 Project Characteristics

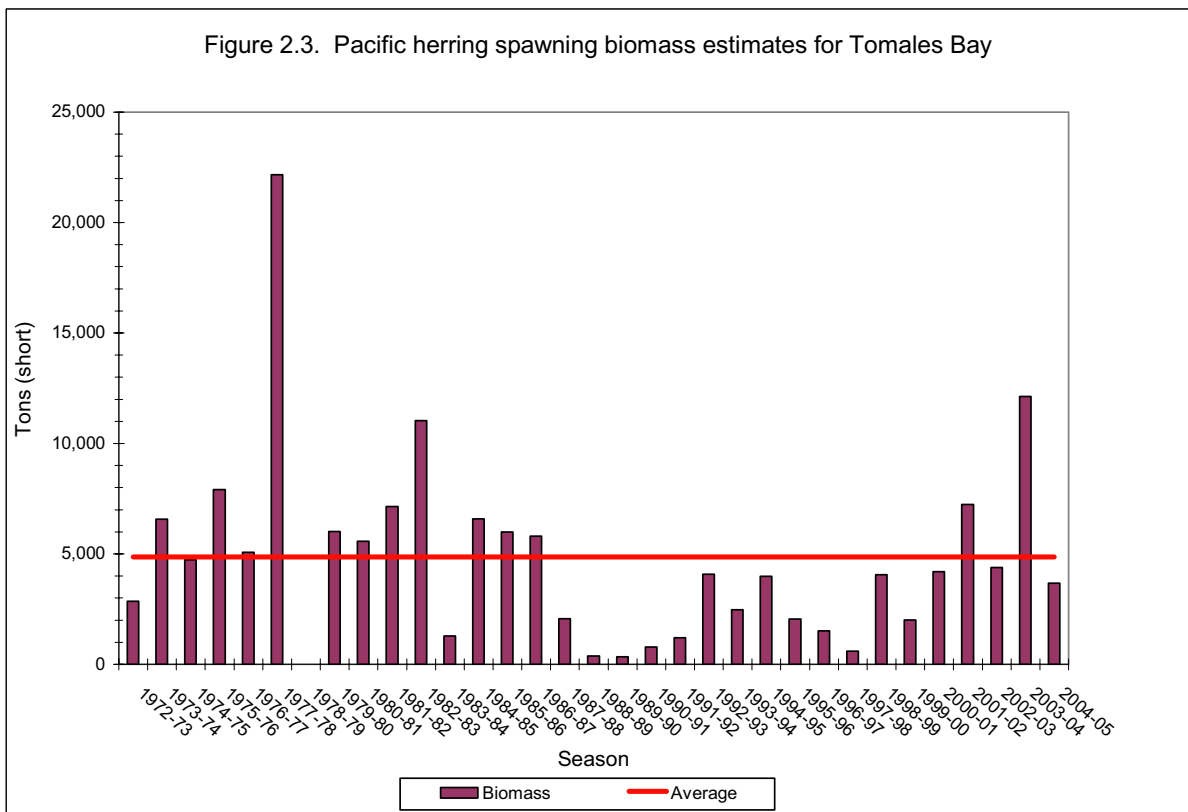
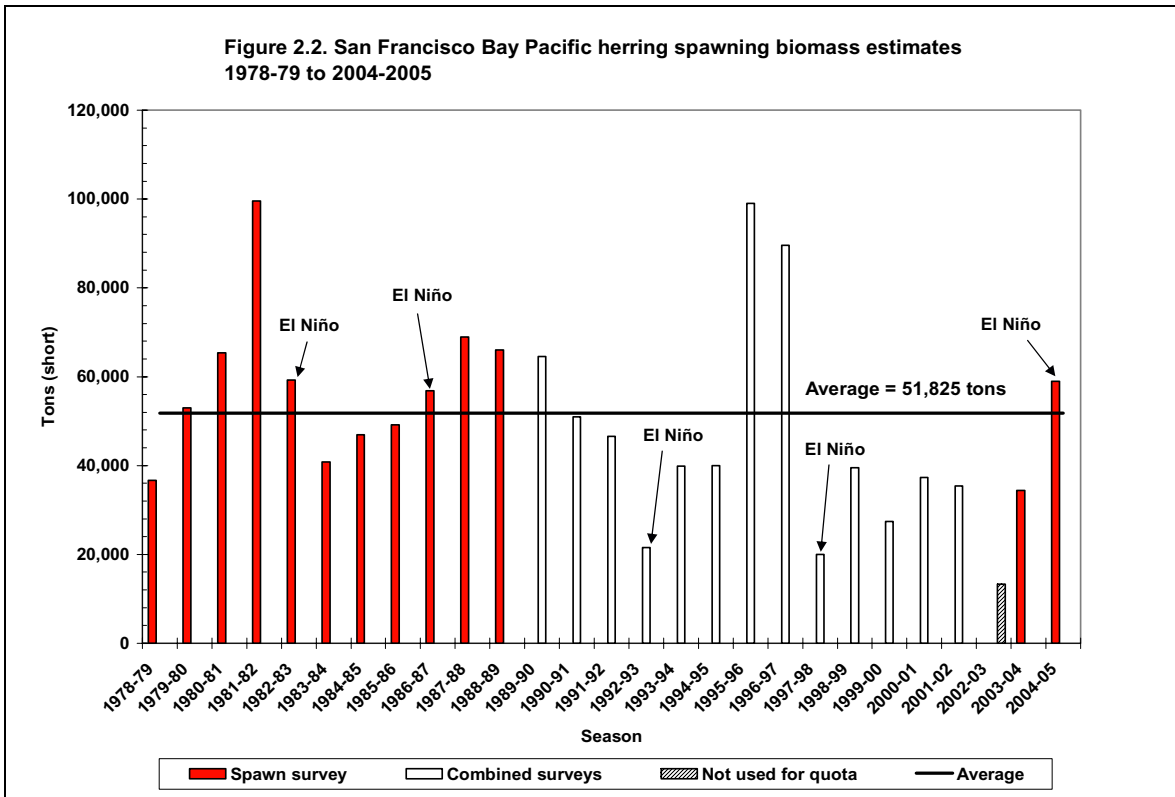
The proposed project recommends continuation of the existing regulations as modified by changes discussed below for San Francisco and Tomales bays. No modifications are proposed for Crescent City Harbor area, Humboldt Bay, and open ocean herring fisheries. These regulations, as amended, will assist in the control of the commercial harvest of herring at a level that meets the State's policy with respect to the use of aquatic resources. This section states the specific purpose of the regulations and summarizes the factual basis for the regulation.

The commercial roe herring and eggs-on-kelp fisheries are closely regulated through a catch-quota system to provide for adequate protection and utilization of the herring resource. The Department conducts annual assessments of the size of the spawning population of herring in San Francisco and Tomales bays (Section 3.2.2.1, FED). These data serve as the basis for establishing fishing quotas for the following season.

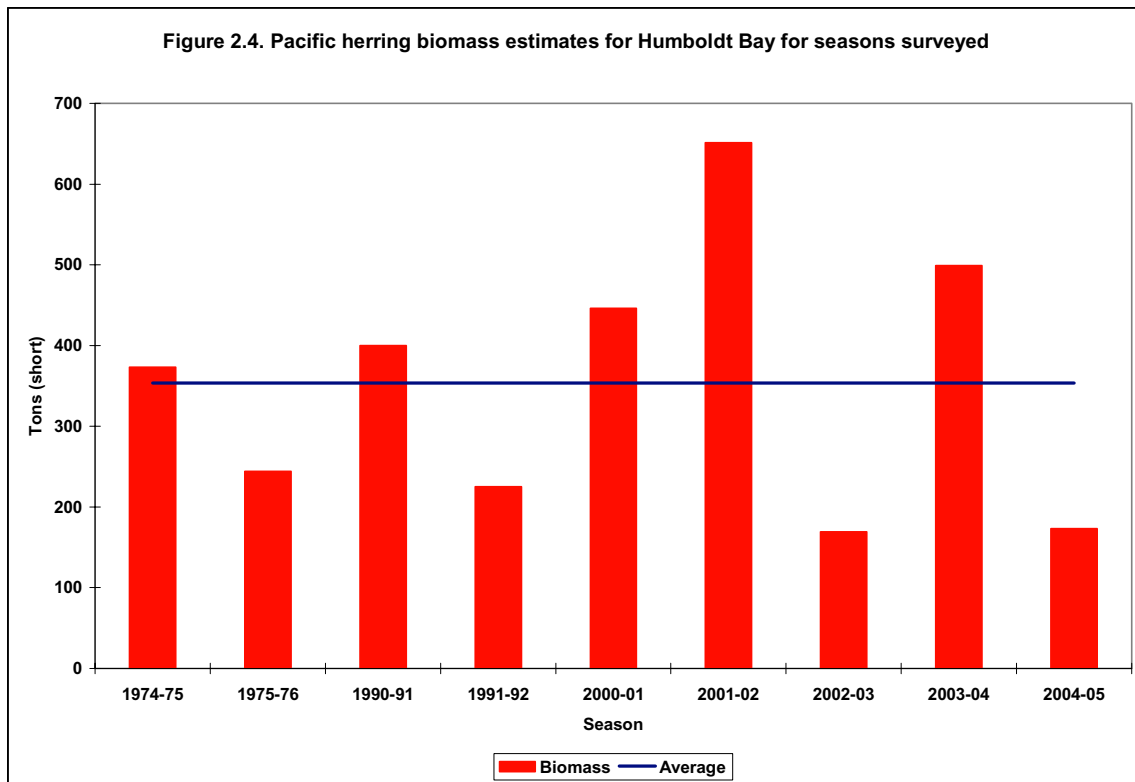
The principal regulatory changes proposed for the 2004-05 season included: a 10 percent harvest guideline based on the 34,400-ton estimated spawning biomass resulting in a 3,400-ton quota for the San Francisco Bay herring fishery (the Department's preferred option) with a season ending date of March 11, 2005, and a 400-ton opening season quota for Tomales Bay. No quota changes were made for the Crescent City/Humboldt Bay fisheries. The regulatory changes proposed for the 2004-05 season were approved by the Commission in August 2004.

Annual herring spawning population estimates from biomass surveys in San Francisco and Tomales bays have been conducted by the Department since 1973. Spawning ground surveys were conducted during the 1974-75, 1975-76, 1990-91, and discontinued in Humboldt Bay following the 1991-92 season; surveys were resumed beginning with the 2000-01 season. Spawning ground surveys are used to estimate spawning biomass in San Francisco, Tomales, and Humboldt bays. Spawning ground surveys assess the total number of eggs spawned and this data is used to calculate the parental population size (Section 3.2.2.1.1 of the FED).

From 1990 through 2003, the Department derived the spawning biomass estimate by meshing the results of the spawn deposition and hydroacoustic surveys. Beginning with the 2003-04 season, the Department conducted hydroacoustic surveys, but primarily as a secondary assessment tool to the spawn deposition survey. The hydroacoustic survey was used to support the location and timing of the spawn deposition survey. Spawning biomass estimates for San Francisco, Tomales, and Humboldt bays are shown in Figures 2.2, 2.3 and 2.4 respectively. The Department does not conduct spawning biomass surveys in the Crescent City Harbor area.



Note: No spawning biomass surveys were conducted in the 1978-79 season.



Annual roe herring fishery quotas are conservative and limit the total commercial catch to no more than 20 percent of the previous season's spawning biomass estimate. The previous season's biomass is considered the best available estimate to quantify herring returning the following season. This exploitation level was selected, based upon computer model simulations developed by the Pacific Fisheries Management Council (Section 3.2.4 of the FED), to help ensure adequate protection of the herring resource while providing long-term sustainability of the fishery. Typically, exploitation rates of no more than 15 percent are recommended to prevent the 20 percent maximum harvest rate from being exceeded. Quotas are not determined by a fixed percentage; they are modified based on additional biological and fishery data collected each season, such as growth rates, strength and importance of individual year-classes, recruitment of incoming year-classes, and oceanographic conditions.

The 2005-06 spawning biomass estimate for San Francisco Bay is 58,934 tons, which is above the 26-year average (2002-03 spawn deposition and hydroacoustic survey were not used for quota calculation and omitted in this average) of 51,825 tons. Landings from the San Francisco Bay roe herring fishery totaled 145 tons, 3,024 tons less than the 3,169-ton quota. This harvest level is 0.02 percent of the season's spawning biomass estimate. In Tomales Bay, the 2004-05 spawning biomass estimate is 3,686 tons, which is a seventy percent decrease from the 2003-04 biomass estimate of 12,124 tons, and nine percent less than the thirteen season average of 4,031 tons (average based on seasons since the fishery re-opened in 1992). Tomales Bay roe herring landings totaled 30 tons, 370 tons less than the 400-ton season quota, and 0.8 percent of the season's estimated spawning biomass.

The spawn escapement estimate for the 2004-05 Humboldt Bay herring spawning season is 173 tons (Figure 2.4). This is close to a 66 percent decline from last season's estimate of 505 tons and only 53 percent of the 9-year average of 328 tons from seasons when spawn assessments were conducted in Humboldt Bay. The commercial Pacific herring landings were low for the 2004-05 season with 0.5 tons landed. This is slightly higher than the same as the 2003-04 season which was the second lowest season recorded for the Humboldt Bay fishery. This harvest level is less than one percent of the season's spawning biomass estimate.

Spawning ground surveys and commercial fishery assessments were not conducted in the Crescent City area for the 2004-05 season. Although all the three permits are active in Crescent City, no fishing effort has taken place in Crescent City for the past three seasons. The Department does not plan to conduct spawning ground surveys and commercial fishery assessments in the Crescent City area for the 2005-06 season.

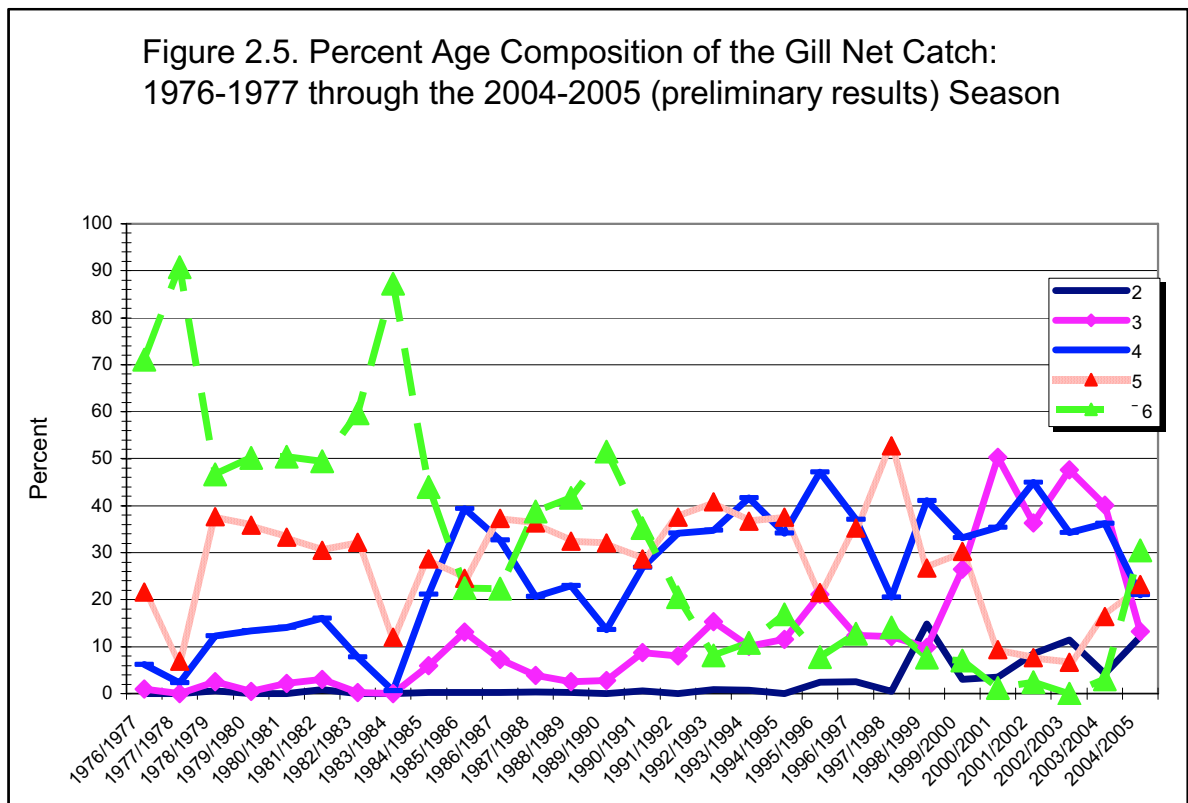
In addition to annual changes in quotas, management recommendations to improve or provide for the efficient harvest and orderly conduct of the herring fisheries are solicited from interested fishermen, individuals at public meetings, and DHAC. The proposed amendments to sections 163, 163.5 and 164, Title 14 CCR,

addressed by this DSED, reflect both Department and the public recommendations brought forward by the Department.

2.3.1 Roe Herring Fisheries

2.3.1.1 San Francisco Bay 2005-06 Quota

The 2004-05 spawning biomass estimate for San Francisco is 58,934 tons (including catch), which is above the 26-year average of 51,825 tons. One of the Department's herring fishery management goals is to allow the harvest of age four and older herring and to avoid the harvest of two- and three-year-old fish, many of which are first-time spawners. Since the 1997-98 El Niño, the estimated numbers of age four and older herring which support the gill net fishery have declined in the population while the number of age three herring has increased in the catch (Figure 2.5).



Note: The percent ages for six-year-old fish is for age six and above combined.

The proposed quota for the 2005-06 San Francisco Bay herring fishery is 5,890

tons, representing approximately 10 percent of the 58,934-ton estimated spawning biomass (Option 1). A harvest rate of 10 percent will provide for a target for stock rebuilding, address the Department's concerns regarding the population size and age structure, and help mitigate for impacts affecting the San Francisco herring fishery related to the 2004-05 El Niño.

Industry members from the San Francisco Bay herring fishery have proposed that the minimum mesh size for the San Francisco Bay fishery be reduced from 2 1/8-in. to 2-in. Due to concerns regarding the proposal by industry, a second option is considered should the reduction in mesh size be adopted. An additional option, Option 2, would set the quota at 4,502 tons which represents 7.6 percent of the 2004-05 spawning biomass estimate if minimum mesh was reduced to 2-in. The Department is concerned that a mesh size reduction would increase the take of age three and potentially age two fish in the commercial catch, and that an increase in the harvest of younger fish may have a long-term negative effect on the population. Since the 1997-98 El Niño, larger, older fish have been scarce or absent in both catch and population samples, declining well below long-term averages.

Setting the quota at less than 10 percent of the 2004-05 spawning biomass estimate would help offset the potential increase in the catch of younger fish. The quota for Option 2 represents a reduction based on the percentage of 2- and 3-year-old herring (11.3 and 12.2 percent by weight respectively) estimated to comprise the 2004-05 season landings. The estimated percentage of 2- and 3-year-old herring is suggested as an approximation of what may be caught in the 2005-06 season. This results in a quota of 4,502 tons or 7.6 percent of the 2004-05 estimated spawning biomass. A more detailed discussion of the potential effects of reducing the mesh size to 2-in. is discussed in Section 2.3.1.5 of this DSED.

Within the overall quota in San Francisco Bay, separate quotas are established for each gill net platoon (i.e., December ("DH"), Odd, and Even platoons). The overall quota is divided among the three platoons in proportion to the number of permits assigned to them. Slight annual adjustments in the quota portions assigned for each platoon are needed to account for attrition of permittees and the use of sac roe herring permits in the herring eggs-on-kelp fishery.

2.3.1.2 Tomales Bay 2005-06 Quota

The Tomales Bay 2004-05 spawning biomass estimate is 3,686 tons, which is 70 percent less than the 2003-04 biomass estimate of 12,124 tons. This season's spawning biomass estimate is nine percent less than the previous twelve-season average of 4,061 tons. During the 2004-05 season, the commercial gill net catch for the Tomales Bay herring fishery was below the initial season quota of 400 tons. The 30 tons landed during the 2004-05 season was the second lowest landing since the fishery was re-opened for the 1992-93 season.

For the 2005-06 season, the Department proposes to set the initial Tomales Bay catch quota at 400 tons, which is 11 percent of the 2004-05 estimated spawning biomass of 3,686 tons. The Department sets Tomales Bay initial quotas conservatively, taking into account recent trends in the spawning population and the best available data. The Department is in the midst of a mesh size study that allows permittees to use a gill net mesh size of 2-in., which is smaller than the 2 1/8-in. mesh allowed prior to the mesh size study. The current regulation specifies that the mesh size shall revert to no less than 2 1/8-in. or greater than 2 1/2-in. after the 2004-05 season, unless otherwise designated in regulation. A proposed quota based upon 11 percent of the 2004-05 spawning biomass is consistent with the Department's conservative management strategy. The proposed one-year continuation of the mesh size study, originally approved for the 2000-01, 2001-02, 2002-03, 2003-04, 2004-05 seasons only, will allow the Department to continue to evaluate the effect of reduced mesh length on the size and age composition of herring caught in 2-in. mesh gill nets.

Since the fishery re-opened, the exploitation rate averaged less than six percent. The exploitation rate during this period has exceeded 10 percent twice, in the 1995-96 and 1996-97 seasons, at 17 percent and 14.7 percent. Since the implementation of the "one net per permittee" restriction, the Tomales Bay commercial catch has only exceeded 300 tons twice, during the 1995-96 and 2001-02 seasons. The quota has been set at an exploitation rate of 10 percent of the average spawning biomass since the fishery was re-opened for the 1992-93 season.

The proposed initial quota of 400 tons provides a conservative starting point for next season, but recent trends in landings of the Tomales Bay fishery suggests that the fleet is unlikely to fill its initial quota.

Due to the relative small scale of the Tomales Bay fishery, the Department has provisions in the regulations that allow for in-season quota increases should the spawning biomass support such increases (refer to Section 2.2.2 of this DSED). The proposed regulations also contain provisions to increase the quota based on in-season estimates of spawning escapement. If the spawning escapement reaches or exceeds 4,000 tons prior to February 15, 2006, the quota shall be increased to a total take of herring, which shall not exceed 500 tons for the season.

2.3.1.3 Humboldt Bay and Crescent City 2005-06 Quota

The 2004-05 herring season marked the fifth consecutive year that spawning ground surveys and commercial fishery monitoring and assessment were carried out in Humboldt Bay since these surveys were discontinued following the 1991-1992 herring season. Spawn escapement for 2004-05 was estimated to be 173 tons, close to a 66 percent decrease from last season's estimate of 505 tons. The total spawning biomass estimate (spawn escapement plus commercial catch) was 174 tons, well below estimates from historic surveys conducted during the 1974-75, 1975-76, 1990-91, and 1991-92 seasons, which recorded a spawning biomass in Humboldt Bay of 372, 232, 400, and 225 tons, respectively.

The commercial Pacific herring landings were down again this season in Humboldt Bay with just over 0.6 tons landed. This is the third lowest season on record for Humboldt Bay, and just a fraction of the average total landings per year of 37 tons since 1983 when the current quota of 60 tons was set. The quota of 60 tons for Humboldt Bay has only been reached once since the 1997-98 El Niño with the herring landings since that event averaging only 15 tons per year.

For the last five seasons the average total landings per year was close to 20 tons with a range of just below 0.6 tons in 2003-04 to 61.2 tons in 2000-01. Two of the last three season's biomass estimates were far below average; however, the exploitation rate during this 3-year period remained below one percent. The average

yearly biomass estimate from the last five spawn assessment surveys conducted since the 2000-01 season is 389 tons. A 60-ton quota based on this average would result in a 15 percent exploitation rate, which is considered a conservative rate of harvest. Spawn assessment data from current and historic surveys suggests that the Humboldt Bay spawning population can support the 60-ton seasonal quota established in 1983. The Department proposes no changes to quotas for the Humboldt Bay or Crescent City herring fisheries for the 2005-06 season. The proposed quota for Humboldt Bay and Crescent City are 60 tons and 30 tons, respectively.

2.3.1.4 Season Dates

Season opening and closing dates for San Francisco and Tomales bays, as well as the dates of various provisions of the regulations, are adjusted each year to account for annual changes in the calendar. The consensus of the DHAC, which met on April 5, 2005, was to recommend that the dates of the roe herring fisheries in San Francisco Bay be set from 5 p.m. on Sunday, December 11, 2005 until 6:00 a.m. on Friday, December 23, 2005 and re-open at 5 p.m. on Monday, December 26, 2005 until 6:00 a.m. on Friday, December 30, 2005 ("DH" gill net platoon only). Recommended dates for the odd and even platoons are from 5:00 p.m. on Monday January 2, 2006 until noon on Friday, March 17, 2006. The consensus among Tomales Bay permittees was to recommend opening at 5:00 p.m. on Sunday, December 25, 2005 until noon on Friday, December 30, 2004, and from 5:00 p.m. on Sunday, January 1, 2006 to noon on Friday, February 24, 2006. The Department concurs with these recommendations. It should be noted that there is an industry proposal to allow weekend fishing in Tomales Bay.

2.3.1.4.1 Weekend Fishing in Tomales Bay

Existing regulations specify that herring fishing is not permitted from noon on Friday through 5:00 p.m. Sunday night in Tomales and San Francisco Bays. The Tomales Bay herring fishermen and their herring buyer propose to change regulations to allow weekend fishing in Tomales Bay during the commercial sac roe

herring season. Removal of the weekend restriction would allow Tomales Bay herring fishermen to operate 24 hours per day, seven days per week, during the season. Fishermen and the buyer have stated that there is an economic need to increase the profitability fishery.

Fishermen and the buyer cite numerous weekend spawning events in the past which in effect, reduced fishing opportunities and potential income. Due to the limited time that herring are available to the fishery, and the variability of spawning biomass composing schools, a weekend spawn could represent a significant portion of season's spawning biomass. It is the goal of the industry in opening fishing on the weekend to increase the profitability of the fishery and fish when spawning events occur, yet potentially limit their time on the water and decrease operating costs. Weekend spawning events that have occurred in the past have limited fishermen from potential catch.

Currently, only the Crescent City and Humboldt Bay herring fisheries are permitted to fish seven days per week. Both Tomales Bay and San Francisco Bay herring fisheries are restricted from fishing from noon on Fridays to 5:00 p.m. Sunday nights. The original intent of the weekend closure regulation was to prevent potential conflict with recreational user groups. The Tomales Bay fishermen feel that unlike San Francisco Bay, the potential for conflict is minimal due to the lack of recreational user groups during winter months on Tomales Bay.

Herring fishermen also believe that there are benefits stemming from the removal of the weekend fishing restriction. They feel that without the weekend closure restriction, fishermen would not be pressured to fish as hard in a limited time frame. Reducing fishing effort pre-spawning herring schools could be achieved by scanning the bay from Highway 1 (Marin County) for signs of spawning prior to fishing. Fishermen would be inclined to fish only during the spawning events which could reduce costs and disruption to the environment. This proposal may reduce harassing herring prior to spawning, allow herring to spawn in a more natural state, and increase profitability for the industry.

Weekend fishing in Tomales Bay would increase costs to the Department in the form of potential overtime of Department personnel. In other state fisheries, for

example the HEOK fishery, a detailed invoice of the cost of operations by the Department for weekend harvest is provided to each individual permittee for payment. The Department proposes that should the Commission decide to allow weekend fishing in Tomales Bay, the Department shall be able to submit a detailed invoice to the appropriate party, or parties, for any increase in the cost of operations.

2.3.1.5 Reduction in the Minimum Mesh Size to 2-in. for Gill Nets Used in the San Francisco Bay Roe Herring Fishery

Industry representatives of the San Francisco Bay sac roe herring fishery proposed a change in the minimum mesh size of gill nets used in the San Francisco Bay from 2 1/8-in. to 2-in. (Appendix A). One of the Department's fishery management goals strategies is to allow the harvest of age four and older herring and to avoid taking 2- and 3-year-old herring which could be caught by the fishery prior to spawning for the first time. Two key benefits to this strategy are: 1) the size of an age class can be assessed before it is vulnerable to being caught; and 2) the population's reproductive potential is increased. Because not all 2-year-olds spawn, the size of a year class is not known until the fish are 3-year-olds. A harvest strategy of age four or older allows the Department to assess a year class for two years before it enters or recruits to the fishery.

The reproductive potential of the population is increased when young fish have the opportunity to spawn. Egg production-per-recruit analysis (Appendix E) indicates a substantial increase in population egg production as a result of a shift in recruitment to the fishery (i.e., the age or size at which fish are first catchable by the fishing gear) from age two to age four. In the early years of the fishery the population's age structure included older cohorts to sustain the fishery and the catch of 2- and 3-year- old herring was extremely low (Figure 2.5). The majority of the commercial catch was comprised of age six and older herring until the mid-1980's.

One of the principal reasons for converting the commercial fishery in San Francisco Bay to an all gillnet fishery and eliminating round haul gear (1994-98) was to further the goal of harvesting age four and older herring (Appendix E). Since the 1997-98 El Niño, there has been a significant decline in the estimated number of age

four and older herring in the population, and a corresponding increase in the number of 3-year-old herring caught by the commercial fishery. The proposed reduction in minimum mesh size to 2-in. is likely to further increase the catch of 3- and possibly 2-year-old herring, conflicting with the Department's management goal of not harvesting those ages.

The Department recognizes the need to review its management strategies and goals for the San Francisco Bay population (2004 FSED, section 3.5) , and to consider employing the use of management tools such as: a threshold for fishery closure and setting harvest percentages; using the stock's fishable biomass rather than total spawning biomass to set the fishery quota; shortening the fishing season to allow early season spawning to recover; and developing an age-structured model to utilize all of the data collected to set harvest levels. The most comprehensive way to consider these and other potential management changes will be through the development of a fishery management plan (FMP) for herring.

For a variety of reasons, the minimum mesh size in the San Francisco Bay herring fishery has varied over time (Appendix C). A reduction in the minimum gill net mesh size allowed for the San Francisco Bay herring fishery is proposed (Appendix A: Mr. Sam Liberati's July 7, 2004 letter). Under this proposal, existing minimum mesh size regulations would be changed from 2 1/8-in. to 2-in. for a trial period of two or more years. The San Francisco herring population and the gill net fishery would be monitored during this period to assess effectiveness of 2-in. mesh size in reducing fishery related mortality. In addition, lowering the harvest rate for the 2005-06 season would offer further protection of the younger age classes. Reducing the 5,890-ton proposed quota by the percentage of 2- and 3-year-old herring (11.3 and 12.2 percent by weight respectively) estimated to comprise the 2004-05 season landings as an approximation of what may be caught in the 2005-06 season, yields a quota of 4,502 tons or a harvest level of 7.6 percent of the 2004-05 estimated spawning biomass. Detrimental effects to the herring population or reduced product value would also be evaluated in determining minimum gill net mesh size following the trial period. The trial period may be ended early if significant negative impacts are identified to the herring population or other resources, or to

product value. At that point the minimum mesh size would revert to 2 1/8-in.

2.3.1.5.1 General Overview of Gill Nets and Department Use of Multi-Panel Research Gill Nets and Mesh Size Study in San Francisco Bay

Observed gill net selectivity is a function of mesh size and the size distribution of fish present at the time the nets are fished. The size distribution of fish landed using an identical net with the same sized mesh fished at various times and locations will be different. The selectivity of the net has not changed, only the size composition of herring encountering the net has changed. Consequently, comparison of gill nets being used in different locations or at different times is not necessarily indicative of the true selectivity of a net (Gregoire and Lefbvre 2003).

There are three ways that herring can be caught in gill nets: snagged by mouth parts, gills, or fins, wedged by head or body, and entangled in loose webbing. The primary method of entrapment in gill nets is wedging followed by snagging, and then entanglement (Potter and Pawson 1991).

There are two primary characteristics of gill nets that are affected by differences in mesh size. These are the “effectiveness” and “efficiency” of nets. Potter and Pawson (1991) define effectiveness as “the attribute of a fishing gear that enables a fisherman to catch fish of a desired species and size”, and landing efficiency as “that proportion of the fish killed as a result of fishing activity that is actually landed and can be recorded”.

As the size of landed herring changes in response to different mesh sizes, the value of the sac roe product will also change. For the herring sac roe fishery, roe technicians sample each landing to determine roe content for buyers. Buyers pay fishermen a premium above a base price for roe percentages exceeding 10 percent. Ovary size and the sex ratio of landings influences the value of the catch, with larger ovaries and fewer males increasing the roe percentage (and thus, the value) of the catch.

The Department and the San Francisco Bay herring fishing industry began what was intended to be a multi-season gill net mesh size study during the 1999-2000 season. The purpose of this study was to evaluate the catch differences

between three mesh sizes: 2 1/16-in., 2 1/8 -in., and 2 3/32-in. (the industry-acknowledged mesh size used by many in the San Francisco gill net commercial fishery). The focus of the study was to compare the age composition of these catches relative to the Department's herring management objective of harvesting age four and older herring while allowing escapement of age two and age three herring. However, the study was incomplete for a variety of reasons including lack of funding and logistical problems encountered by the study participants.

The Department's Pacific herring research project has used variable mesh gill nets to sample herring schools in combination with other gears since 1981 in San Francisco Bay. The Department's research gill nets were constructed of an array of mesh sizes: 1 1/2-in., 1 3/4-in., 2-in., 2 1/4-in. and 2 1/2-in. These mesh sizes were selected to sample the entire range of herring sizes present in the San Francisco Bay population, not to evaluate the optimal mesh size for the commercial gill net fishery. Because of this, direct comparisons between the catches of research gill nets and commercial gill nets are difficult to make. Other factors that make comparisons difficult include: 1) differences in the construction material used in the Department research gill nets and commercial fishery, which likely result in differences in selectivity; 2) the Department's array of web sizes does not include the mesh size(s) existing in the current fishery; 3) the Department sampled in areas away from commercial fishing activity to avoid potential conflicts with gear; and 4) the Department did not attempt to sample on a consistent basis at night when the commercial fishery was most active.

Despite the difficulties described above, some general conclusions can be drawn from the Department's use of variable mesh gill nets relative to the proposed gill net mesh size reduction: 1) the lengths of fish caught declined with mesh size; 2) the ratio of males increased with declining mesh size; and 3) the ratio of females increased with increasing mesh size (Reilly and Moore, 1987).

2.3.1.5.2 Gill Net Mesh Range of Selectivity for Herring: Analysis of Other Studies

Fishery scientists have used several different length measurements for herring. The Department of Fish and Game's herring project measures body length,

while Hay et al. (1986) measured herring standard length in British Columbia, and Gregoire and Lefebvre (2003) measured total length of Atlantic herring (*Clupea harengus*). The relationship between body, standard, and total length is predictable and can be easily converted, so for this analysis, all length measurements have been converted to total lengths (TL) (Table 2.1). Hay et al. (1986) found that herring measuring 280 mm TL were the optimal size for a 2 1/4-in. mesh gill net. Gregoire and Lefebvre (2003) show that the optimal herring length selected for changes by about 0.7-in. for each 1/8-in. change in mesh size, when comparing mesh sizes of 2 1/2-, 2 5/8-, and 2 3/4-in. Clarke and King (1986) examined smaller gill net mesh sizes of 2-, 2 1/4- and 2 1/2 -in. and found that optimal size selectivity changed from about 240 mm TL to 310 mm TL between the smallest and largest meshes. This is consistent with the work of Gregoire and Lefebvre (2003). Hay et al. (1986) used a 2 1/4-in. mesh net in their study and found that few fish smaller than 234 mm TL were caught while most fish larger than 255 mm TL were captured. In summary, these studies indicate that the optimal size selected for would drop by approximately 0.7-in. for a 1/8-in. reduction in mesh size (Table 2.2).

Table 2.1. Comparison of various length measurements (mm) from San Francisco Bay herring			
<u>Body Length</u>	<u>Standard Length</u>	<u>Fork Length</u>	<u>Total Length</u>
118	115	126	140
118	114	126	140
122	118	129	145
126	121	133	149
126	122	133	150
125	121	134	150
125	120	134	150
126	123	134	151
132	128	141	155
133	127	142	158
137	131	143	163
138	134	147	163
143	138	150	168
147	143	155	174
146	141	158	174
151	145	157	177
152	146	160	181
155	149	164	181
152	148	161	182
155	150	165	183
156	152	166	186
157	152	166	187
159	155	170	188
162	157	170	190
161	154	170	191
164	158	172	191
165	156	171	192
162	157	173	194
164	159	174	195
166	160	180	196
165	161	175	197
168	162	177	197
166	160	176	198
173	169	185	208
177	172	188	209
176	171	186	210
178	171	187	212
181	173	190	213
183	177	193	216
184	178	196	219
179	174	188	221
187	180	198	224
190	184	203	224
191	184	202	224
182	176	195	225

Table 2.2. Optimal length selectivity by mesh size from four herring gill net mesh size studies. Hay et al. (1986) estimate based on a known number of fish and thus is a true estimate of optimal selectivity. The other studies are based on observed catches only.

Mesh Size		Hay et al. 1986	Gregoire & Lefebvre 2003	Clark & King 1986	Winters & Wheeler 1986	Winters & Wheeler 1987
mm	in					
50.8	2.00			248	255	291
57.2	2.25	280		284	287	327
63.5	2.50		380	314	318	363
66.8	2.63		399			
69.9	2.75		418		350	400

Winters and Wheeler (1990) used gill nets with mesh sizes from 2-in. to 3-in. for two seasons, 1986 and 1987, fishing for Atlantic herring. Their optimal length selectivity for 1986 was similar to Hay et al. (1986) and Clark and King (1986), but was considerably greater in 1987, perhaps as a result of following several large year classes through the fishery (Table 2.2). The difference may have been in the growth of these numerically dominant cohorts between years. In a Bering Sea herring gill net study, observed optimal selectivity for 2-in mesh gill nets ranged from 212 mm to 240 mm with a mean of 224 mm for eight different fisheries (Quang 2002).

2.3.1.5.3 Age Selectivity of 2 1/8-in. and 2-in. Mesh Gill Nets

Theoretically, a 2 1/8-in. mesh gill net has an optimum length selectivity of about 276 mm which is an 8-year-old herring or older (Table 2.3, Figure 2.6). At the 50% catch range, 2 1/8-in. mesh gill nets are able to catch larger 5-year-olds, and at the 25% range, about half the 5-year-olds are vulnerable. A 2-in. mesh gill net has an optimum length of capture around 260 mm (Table 2.3) which is about the mean length of 8-year-old fish (Figure 2.6). At the 75 percent selectivity range, most 6-year-olds and larger 5-year-olds would be vulnerable. At the 50 percent selectivity range, almost 50 percent of the 4-year-old fish and large 3-year-old fish would be vulnerable, and at the lower 25 percent retention rate most 4-year-olds and larger 3-year-olds are vulnerable (Figure 2.6).

Table 2.3. Estimated percent of herring captured by fish length (mm) by gill net mesh size for 2-in. and 2-in. based on data from Hay et al. (1986) in British Columbia. Hay et al. (1986) used standard length as their measurement. Total lengths were calculated based on linear regression from San Francisco Bay herring length measurements.

% Retained	<u>Hay et al. 1986</u>		<u>Estimated</u>			
	2 ¼-in.		2 -in.		2-in.	
	TL	SL	TL	SL	TL	SL
25	252	200	233	181	214	162
50	265	210	246	191	227	172
70	277	220	258	201	239	182
80	295	235	276	216	257	197
70	314	250	295	231	276	212
50	326	260	307	241	288	222
25	338	270	319	251	300	232
Regression equation : Total Length = 0.776 + 1.223 * Standard Length						

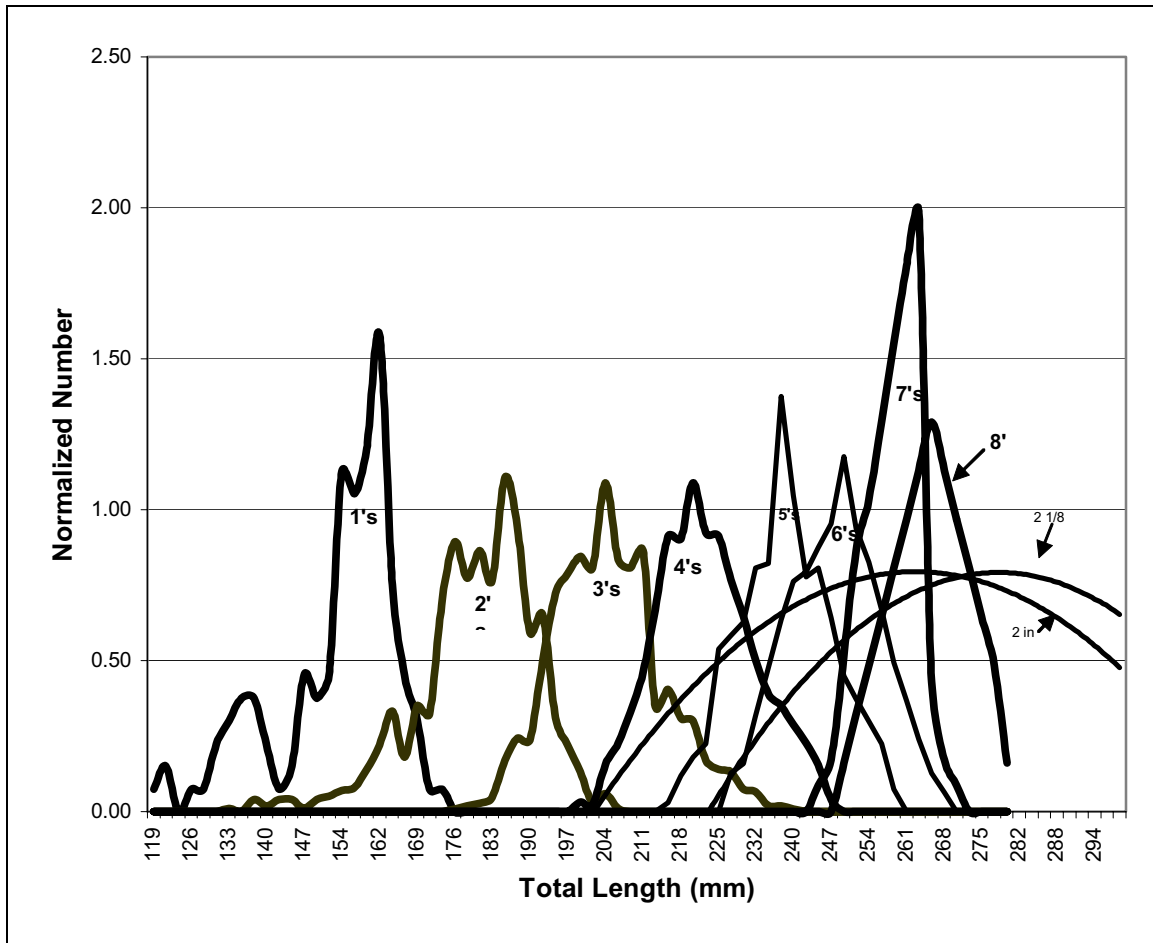


Figure 2.6. Normalized length (total length) distributions of San Francisco Bay herring ages 1 through 8 from research surveys in the 1988-89, 1989-90 and 1990-91 seasons. The two rounded arcs are the length selectivity percentages of herring for 2-in. mesh and 2 $\frac{1}{8}$ -in. mesh gill net. These years were selected because they contained ages from 1-year-old to 8-year-old. Tails of the age curves have been truncated. Age curves are normalized so that the curves enclose the same area and do not reflect the actual age distribution of fish in the population in these years.

Considering the current age composition of the San Francisco Bay herring population (Table 2.4), which lacks age 7 and older herring and has seen a decline in 6-year-old herring, neither 2 $\frac{1}{8}$ -in. nor 2-in. mesh can be considered efficient mesh sizes. Less efficient mesh size has been chosen to reduce the catch of smaller fish for economic reasons and to protect smaller first-time spawning herring.

Table 2.4. Estimated Numbers (x 1,000) of Herring-at-Age in the San Francisco Bay Spawning Population, 1982-83 to present

Age and Percent Composition																			
Season	1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	Total
82-83	a	N/A	87,908	14.8	149,971	0.3	182,936	30.7	118,040	19.8	30,478	5.1	17,177	2.9	8,121	1.4	797	0.1	595,428
83-84	a	N/A	332,699	56.6	69,654	0.1	92,565	15.8	73,840	12.6	17,306	2.9	1,168	0.2	117	0	0	0.0	587,349
84-85	a	N/A	184,695	38.7	190,998	40.0	46,613	9.8	22,153	4.6	25,914	5.4	6,652	1.4	688	0.1	0	0.0	383,033
85-86	a	N/A	162,422	32.4	160,613	32.1	126,535	25.3	26,790	5.3	16,038	3.2	7,752	1.5	717	0.1	182	0.0	501,049
86-87	a	N/A	168,962	29.2	194,365	33.6	134,528	23.2	64,598	11.2	9,182	1.6	6,175	1.1	1,065	0.2	246	0.0	579,121
87-88	a	N/A	233,193	30.6	292,508	38.3	136,604	17.9	66,494	8.7	25,337	3.3	5,027	0.7	3,939	0.5	0	0.0	763,102
88-89	a	N/A	146,525	25.8	222,058	39.0	139,906	24.6	44,435	7.8	12,310	2.2	3,030	0.5	534	0.1	0	0.0	568,798
89-90	a	N/A	294,631	37.6	237,377	30.3	136,248	17.4	84,361	10.8	23,970	3.1	6,572	0.8	0	0	0	0.0	783,159
91-92	1,356	0.3	13,666	3.0	126,016	28.0	206,930	45.2	82,870	18.1	23,764	5.2	3,490	0.8	0	0	0	0.0	458,092
92-93	0	0	48,925	20.5	50,398	21.1	79,045	33.1	51,713	21.7	8,642	3.6	0	0	0	0	0	0.0	238,723
93-94	11,485	2.6	22,403	5.1	134,870	31.0	160,335	36.9	63,331	14.6	25,926	6.0	4,808	1.1	355	0.1	0	0.0	423,513
94-95	2,276	0.5	39,363	9.0	236,783	54.1	94,833	21.7	42,850	9.8	18,223	4.2	3,196	0.7	0	0	0	0.0	437,524
95-96	3,142	0.3	483,164	38.9	359,357	29.0	282,069	22.7	81,768	6.6	28,904	2.3	1,687	0.1	0	0	0	0.0	1,240,091
96-97	1,184	0.1	290,497	29.1	359,459	36.0	183,370	18.4	120,029	12.0	33,098	3.3	8,935	0.9	270	0	0	0.0	996,842
97-98	42	0	45,092	17.2	129,411	49.3	65,637	25.0	18,724	7.1	2,259	0.9	1,430	0.5	0	0	0	0.0	262,595
98-99	1,931	0.4	256,816	52.0	54,306	11.0	114,835	23.2	56,915	11.5	9,729	2.0	558	0.1	978	0.2	^b	0.0	496,068
99-00	1,440	0.4	103,490	30.4	154,260	45.3	48,150	14.1	29,000	8.5	4,310	1.3	0	0	0	0	^b	0.0	340,650
00-01	255,158	36.0	178,401	35.43	185,748	36.9	65,555	13.0	24,267	4.8	126	0.0	0	0	0	0	0	0.0	709,255
01-02	5,788	1.5	157,182	39.6	138,752	35.0	75,088	18.9	15,383	3.9	4,265	1.1	152	0	0	0	0	0.0	396,610
03-04 ^c	2,473	0.5	328,257	65.5	122,072	24.3	26,641	5.3	14,848	3.0	7,225	1.4	0	0	0	0	0	0.0	501,516
04-05 ^d	1,096	0.1	442,928	55.4	164,566	20.6	122,103	15.3	59,676	7.5	8,875	1.1	0	0	0	0	0	0.0	799,244
Mean	22,105	3.3	191,487	31.8	177,788	30.3	120,025	21.8	55,337	10.0	15,994	2.8	3,705	0.6	839	0.1	68	0.0	587,349

Note: 1990-91 season was not included due to incomplete data set for that season; 2002-03 season spawning biomass estimate unresolved.

^a 1-year-olds were not estimated, ^b 9-year-olds were not estimated, ^c includes corrected estimated numbers of herring, ^d percentages are the average percentages for all years, not the percentage that the average number represents

As stated previously, observed (i.e., actual) gill net selectivity is a function of mesh size and the size distribution of fish present at the time the nets are fished. The observed catch (i.e., actual catch) of Pacific herring in San Francisco Bay in 2 1/8-in. mesh differs considerably from the theoretical optimum selectivities reported above because the San Francisco Bay population lacks herring of optimum sizes for 2 1/8-in. mesh. It also lacks herring of the optimal size for 2-in. mesh. Therefore, 2-in. mesh, while slightly more efficient than 2 1/8-in. mesh, is still not an efficient mesh size, which means that many herring will still swim through it. In addition, 2-in. mesh will catch more 3-year-old herring.

A number of factors will affect the observed ages of fish caught by fishing gears, including gill nets. For example, all ages of fish are not usually present in equal numbers. Gregoire and Lefebvre (2003) found differences in the observed selectivity of the same nets between years and theorized that the differences were due to changes in herring age (and thus, size) composition between years. Winters and Wheeler (1990) had quite different results between the two years of their study using the same mesh size. Winters and Wheeler (1990) found that the 2-in. mesh net had the highest fishing power in 1987 while the 2.5-in. mesh net had the highest fishing power the previous year. Observed catch curves occur to the left of true net selectivity curves as a result of both natural and fishing mortality (Clark and King 1986).

2.3.1.5.4 Efficiency

As stated previously “efficiency” is that portion of fish which are killed as a result of fishing and can be recorded as landed. In the herring roe fishery we can further restrict this definition to those fish for which the roe can be processed and sold. Fish caught by medial to posterior wedging (i.e., belly caught) often have ovaries broken and eggs extruded limiting the value of such fish (Figure 2.7).

Figure 2.7. “Belly caught” commercial gill net herring from San Francisco Bay: 2004-05 Season.



Other fish are killed and lost during gill net retrieval when they fall from the net into the water (gill net dropout). An unknown proportion of dropout herring may survive, some may die due to causes of latent mortality (i.e., injuries sustained in the net or by disease), while others may be eaten by birds or marine mammals (Ken Oda, California Department of Fish and Game, personal communication). Dropout rates and resultant mortalities, which have been estimated at less than two percent, do not appear to change significantly with gill net mesh size (Hay et al.1982).

For the San Francisco Bay herring fishery, reducing the minimum gill net mesh size from 2 1/8-in. to 2-in. may reduce the medial wedging of large 3-year-old herring but may shift this problem to smaller 3-year-olds in the San Francisco herring fishery. However, if quotas can be achieved with less fishing effort then total mortality associated with fishing may be reduced.

2.3.1.5.5 Mortality of Herring Escaping Through Gill Nets

Small fish will escape through mesh that is too large for them with minimal damage. Herring swimming through the nets tend to lose more scales as size

approaches the net selectivity (Hay et al. 1986). Yet despite the increased scale loss with size, mortality rates were low even for fish with 75 percent scale loss (Hay et al. 1986). These authors estimate a swim-through mortality of 2 percent or less. It should be noted that the authors did not subject fish to repeated net contact. If swim-through mortality were 2 percent for first-time net encounters, then mortality rates would likely increase with an increase in net encounters. At present there is no evidence that this is an issue. Nonetheless, reducing the number of times smaller herring pass through nets should lower fishing mortality on non-landed herring.

2.3.1.5.6 Reduced Value of Landed Fish

On average, a reduction in mesh size from 2 1/8-in. to 2-in. could result in a decline in the size of fish landed of about 0.7-in. This will shift exploitation rates down about two ages, from primarily targeting 5-year-olds and above to targeting 3-year-olds and older (Figure 2.5). Until the 2004-05 season, landings in recent years have been composed primarily of 3- and 4-year-old fish with declining numbers of 5-year-old and older fish, due to declines in abundance of these older herring in the population (Figure 2.5).

With a reduced mesh size, the average size of 3- and 4-year-old fish in the catch should decline because the 2 1/8-in. currently catches larger 3- and 4-year-olds. There may also be an increase in catch of males which have a lesser girth on average than females. The end result could be an increase in processing costs because processing time is similar for a fish regardless of size and larger fish produce larger roe sacs and generally higher roe counts. Fishermen may see a reduction in catch value due to lower roe counts; however, this reduction in catch value may be mitigated by higher landings and reduced overhead

2.3.1.5.7 Incidental Catch

There are two issues of concern associated with incidental catch. The first is that the species composition of incidental catch may change. The second is that mortality rates of incidental catch may change. Incidental catch in herring gill nets is quite low. The ratio of incidental catch to herring catch over a three year period was

0.0017-in. for research gill nets set to catch herring (FED, 1998). The change to a smaller minimum mesh net may have an effect in the average size of incidental catch, but the change will be small and have little effect on species composition of incidental catch. If there were a shift in species composition, overall effects would still be minimal because of low incidental catch. A portion of incidental catch is due to entanglement of larger fish and this will be affected very little by one eighth of an inch decrease in minimum mesh size. With the potential reduction of minimum mesh size to 2-in. in San Francisco Bay, there is, however, the possibility of a take of endangered and threatened salmonid species (See Section 3.6.2).

2.3.1.5.8 Sustainability of the Herring Population

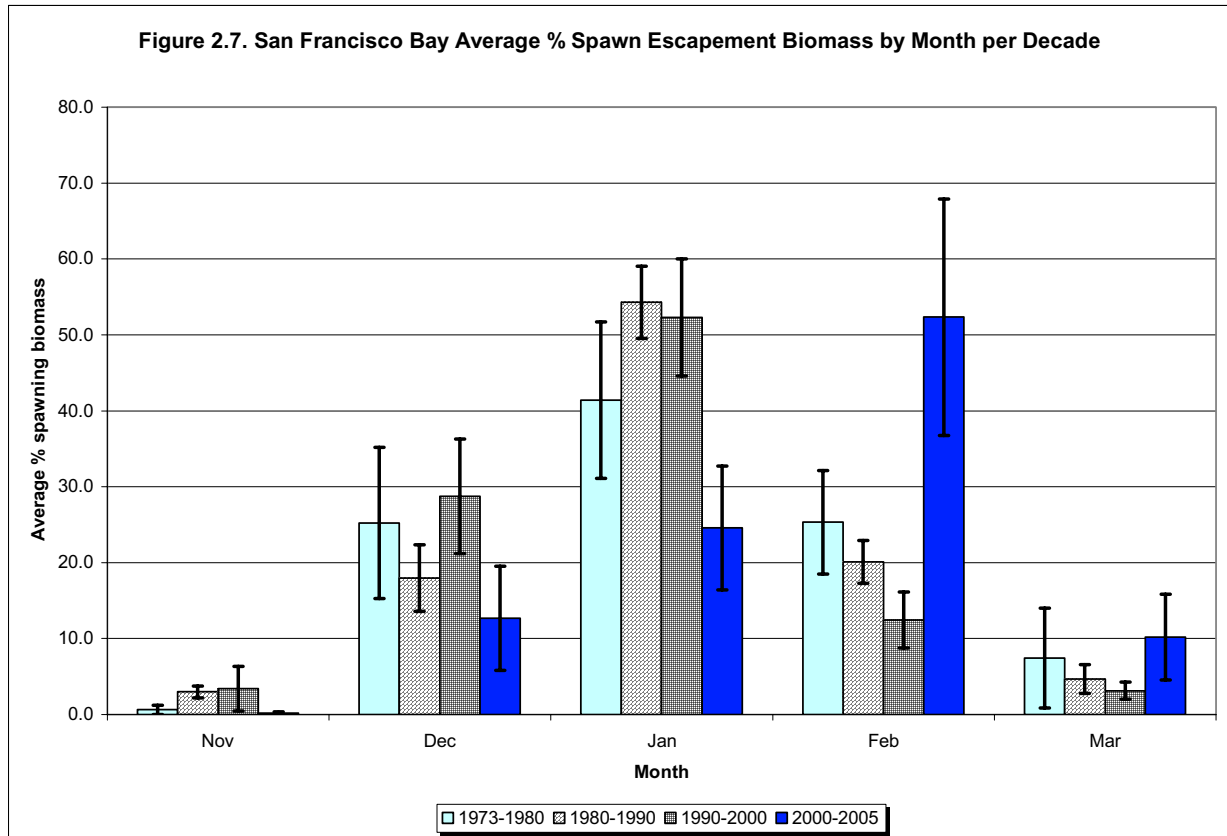
The herring population has not fully recovered from the 1997-98 El Niño. The fishery has failed to meet quotas in the last four seasons with the lowest catch-to-quota ratio in 2004-05 (Table 2.5). If the Commission continues to set conservative quotas, and fishery induced non-landed mortality can be kept at a minimum, then the fishery may have a minimal effect on rebuilding of the population and its age structure. However, there is a level of recruitment at which even a minimal fishery could delay the rebuilding period. If poor recruitment occurs over the next several years, then a fishery closure should be considered. These concerns tend to be independent of minimum mesh size regulations if quotas are adjusted accordingly to conservative harvest levels.

The age structure of the San Francisco herring population since the 1997-98 El Niño has been made up primarily of 2- to 4-year-old fish, with very few older fish (Table 2.4). Historically, earlier spawns have been composed of older

Table 2.5. San Francisco herring price, roe percent, ex-vessel price per ton quota, landings and total estimated value to fishermen

Season	Base Price	Ave Roe %	Ex-Vessel/ Ton	Quota	Landings	Value \$1000
1985-1986	\$1,100	12.2	\$1,342	7,530	7,728	\$10,371
1986-1987	\$1,200	11.7	\$1,404	7,470	8,098	\$11,370
1987-1988	\$1,300	13.5	\$1,755	8,432	8,741	\$15,340
1988-1989	\$1,250	11.5	\$1,438	9,238	9,736	\$14,000
1989-1990	\$1,200	13.0	\$1,560	9,057	8,962	\$13,981
1990-1991	\$900	13.3	\$1,197	8,858	7,741	\$9,266
1991-1992	\$1,200	13.9	\$1,668	7,134	7,417	\$12,372
1992-1993	\$500	13.0	\$650	5,175	5,151	\$3,348
1993-1994	\$600	11.7	\$702	1,996	2,302	\$1,616
1994-1995	\$1,400	12.3	\$1,722	4,408	4,574	\$7,876
1995-1996	\$2,300	13.8	\$3,174	5,524	6,165	\$19,568
1996-1997	\$1,000	13.3	\$1,330	13,543	11,496	\$15,290
1997-1998	\$400	11.3	\$452	9,793	1,981	\$895
1998-1999	\$625	15.3	\$923	2,739	2,817	\$2,600
1999-2000	\$800	14.2	\$1,136	5,925	3,356	\$3,812
2000-2001	\$700	13.1	\$917	2,499	2,991	\$2,743
2001-2002	\$600	15.9	\$951	4,128	3,287	\$3,126
2002-2003	\$600	15.1	\$906	3,262	2,097	\$1,900
2003-2004	\$500	13.6	\$680	2,020	1,540	\$1,047
2004-2005	\$500	16.2	\$810	3,169	143	\$116
Mean	\$934	13.4	\$1,236	6,095	5,316	\$7,532

fish with the youngest fish spawning later in the season. With the exception of the 2004-05 season, in recent years there have been few significant spawns in November and December (Figure 2.7).



Eggs of larger herring are larger than are eggs from younger herring and may make a higher contribution to recruit-per-egg (i.e. survival) than eggs from younger fish. Studies on the timing of spawning have indicated that recruitment events vary between years so that in a given year, conditions may be better for recruitment at different times during the spawning period (Berkeley et al. 2004). Consequently, it makes sense to maintain the age structure of the San Francisco herring population close to the virgin population structure so that spawning takes place throughout the historic spawning period and throughout the spawning areas in the Bay (Berkeley et al. 2004; Watters et al. 2004).

2.3.1.6 Gill Net Length Measurement

Subsection (f)(2)(B) of the roe fishery regulations specifies that no permittee shall possess or fish more than a total of 65 fathoms (1 shackle) of gill net in San Francisco

and Tomales Bays. Several members of the herring industry have expressed concern and some confusion as to where gill net length measurement is taken by Department enforcement. Both Department enforcement and industry agree that the length measurement should be taken along the cork line and that this should be specified in regulation. The Department is proposing to add the phrase “as measured at the cork line” to further specify and clarify gill net length measurement in the regulations.

2.3.1.7 Permit Changes

2.3.1.7.1 Transfer Fee Reduction

Under existing law (Fish and Game Code Section 8550), Pacific herring may be taken for commercial purposes only under the authority of a permit, and herring permits are transferable under the provision of Fish and Game Code Sections 8552.2 and 8552.6. Fish and Game Code Section 8552.7 currently sets the fee to transfer a herring permit at \$5,000, but existing law (Fish and Game Code Section 8552.1) authorizes the Fish and Game Commission (Commission) to adjust the herring permit transfer fee to a level that will not discourage the transfer of permits or limit entry into the fishery, and that will ensure sufficient funds to cover reasonable Department of Fish and Game (Department) costs associated with management of the fishery.

Fish and Game Code Section 8552.3, provides the Commission with the authority to adopt regulations to facilitate transfer of herring permits including regulations that would allow an individual to own a permit for each of the three gill net platoons (also called fishing groups and designated DH, Odd, and Even) in San Francisco Bay; eliminate the point system for qualifying for a herring permit; and allow a herring permit to be transferred from a parent to child or between spouses. Existing law (Fish and Game Code Section 8552.2) limits permit transfers to individuals with at least 20 herring fishery points (also known as experience points) unless the permit is transferred to partner in a partnership established under the provision of Fish and Game Code Section 8552.6. Permits held in partnership may be transferred to one of the partners if that partner has at least 10 experience points and the partnership has existed for at least three consecutive years. Fish and Game

Code Section 8552.8 establishes the basis for earning experience points in the roe herring fishery.

The proposed regulations would lower the herring permit transfer fee from \$5,000 to \$1,000. The proposed regulations to facilitate transfers are based on recommendations received from a group of Director's Herring Advisory Committee members. Those regulations would: authorize permit holders in San Francisco Bay to hold permits in more than one platoon; eliminate the point system and establish new eligibility criteria for permit transfer; establish new criteria for transferring a permit held in a partnership; specify the documents needed to demonstrate eligibility; eliminate the requirements that a permit holder mail a notice of intention to transfer to everyone on the Department's list of individuals with experience points (commonly called the 20-point list). The proposed regulations would also specify the requirement for requesting a permit transfer, and provide a process to appeal a Department denial of a transfer.

The current fee of \$5,000 is inhibiting transfer of permits, and is creating an economic hardship for permit holders who want to leave the fishery and for fishermen who want to enter the fishery. Many permit holders consider the \$5,000 fee excessive and inequitable during a period when the market value of the permits is relatively low. Lowering the permit fee to \$1,000 would lower the economic barrier for permit transfers while still providing the Department with revenue for herring research and management.

The herring permit transfer fee was not established to cover the administrative costs of transferring a permit, but rather as a means to help fund herring research and management. The commercial roe herring fishery has been regulated by fixed numbers of permits since 1973, and the permits were not transferable (except to a working partner or family member upon death of the permit holder) until 1989. Thus, the Department did not initially issue an item of real monetary value, because the permits were not transferable and initial issuance of a permit was at no cost to the recipient except for the annual permit fee. The passage of AB4597 in 1989, with the provision for full transferability of herring permits, assigned a real monetary value to possession of a herring permit without accruable

monetary benefit to the state. To rectify that, AB4597 required that a transfer fee be paid to the state.

Anecdotal information from fishermen as well as trends for the number of permit transfers, number of permits reverting to the state, and the number of partnerships indicate that the current transfer fee of \$5,000 is a barrier to the sale and transfer of herring permits. The number of transfers per year dropped markedly after the transfer fee increased from \$2,500 to \$5,000 on April 1, 1997. The number of permits reverting to the state has increased dramatically in the last two seasons; a permit reverts to the state when the permit was not sold and transferred after the death of a permit holder or when the permit holder choose not to renew the permit. Many herring permit holders have deferred formal permit transfer and the attendant \$5,000 fee by formation of business partnerships (under the provisions of Fish and Game Code Section 8552.6) which authorizes the secondary (or junior) partner to actually fish the permit for an unlimited time period. In many ways, this results in a *de facto* transfer. Currently, there are 113 partnerships of which 81 are business partnerships and 32 are marriage partnerships.

Herring permit transfer procedures are specified in statute (Fish and Game Code Sections 8552.2 and 8552.6). The administrative and fiscal impacts to the Department for completing a transfer are minor. The reduction in the fee will not impact the Department's ability to complete permit transfers. Existing law (Fish and Game Code Section 8552.7) states that the transfer fees shall be used for research and management of herring. On average, the revenues from the transfer fee represent about 4 to 5 percent of the revenue that the Department receives directly from the herring fishery and about 7 percent of the revenue deposited in the Herring Dedicated Account for herring management and research. If the number of permit transfers per year stays the same as the average number per year since the transfer fee was increased to \$5,000 on April 1, 1997 (i.e., about 4 per year), then the Department would lose revenues. However, if the number of permit transfers per year equals the average number of transfers when the fee was less than \$5,000 (i.e., 32 per year), then the Department would not lose revenues. Any revenues lost due to the lower transfer fee would need to be absorbed by the Department within

existing budgets and resources, or the Department would need to find ways to reduce the cost of managing the herring fisheries.

2.3.1.7.2 Other Measures to Facilitate Transfers

Members of the fishing industry argue that other socio-economic factors besides the transfer fee are inhibiting herring permit transfers. The following proposals to facilitate transfers of herring permits are based on recommendations received from a group of Director's Herring Advisory Committee members. In combination the proposals are designed to facilitate transfer by increasing the number of people eligible to purchase a herring permit while limiting permit speculation.

The proposed regulations would authorize permit holders in San Francisco Bay to own permits in more than one platoon (odd-numbered permits, even-numbered permits, and December herring ("DH") permits), but would prohibit anyone from holding more than one permit per platoon. Individuals holding converted round haul ("CH") permits that are authorized to fish in two platoons would be allowed to own a permit for the platoon that is not authorized under his or her CH permit. An individual who is a partner (primary or secondary partner) of a permit held in partnership would not be allowed to hold another permit (either as sole owner or as a partner) for the same platoon as the permit held in partnership.

The first two years (November 15, 2005 to November 15, 2007) would serve as a transition period for permits that are not held in partnership. The following individuals would qualify for a permit during the transition period: individuals with 20-points under the current point system (defined in Fish and Game Code Section 8552.8); recent fishery participants (defined as having fished in at least one of the following herring seasons: 2001-2002, 2002-2003, 2003-2004, or 2004-2005); the spouse and children of the current permit holder; and current San Francisco Bay permit holders who are purchasing another San Francisco Bay permit (secondary partners are not considered current permit holders under this qualifying criterion). The Commission is provided the option of only allowing the transfer to spouses and children (who would not qualify otherwise) when the permit holder dies.

After November 15, 2007, the point-system would be eliminated, and new eligibility criteria would be in place for permits that are not held in partnership. The proposed regulations would limit transfers to individuals who meet at least one of the following criteria: have fished in the roe herring fishery in California for at least one season and have held a California commercial fishing license for at least three years; is a spouse or child of the current permit holder; or is a current San Francisco Bay permit holder who is purchasing another San Francisco Bay permit (secondary partners are not considered current permit holders under this qualifying criterion). The Commission is provided the option of only allowing the transfer to spouses and children (who would not qualify otherwise) when the permit holder dies.

If a partnership was formed before June 24, 2005 and the Department has received written notification by June 24, 2005 that the partnership was formed, the transfer of a permit to one of the partners will be under the provisions of existing statute (Fish and Game Code Section 8552.6). If a partnership is formed after June 24, 2005 or the Department receives written notification after June 24, 2005 that the partnership was formed, the permit may be transferred to one of the partners and the permit held solely by that partner (transferee) only if the transferee fished in a herring roe fishery in California for at least one herring season and has held a California commercial fishing license for at least three years.

The proposed regulations would prescribe the documents needed to demonstrate eligibility. To reduce the burden on the permit holder, the proposed regulations would eliminate the requirements that a permit holder mail a notice of intention to transfer to everyone on the Department's list of individuals with experience points (commonly called the 20-point list). To facilitate administration of the proposed changes, the proposed regulations specify the requirement for requesting a permit transfer, specify that an application must be for each permit each season, and provide a process to appeal a Department denial of a transfer.

2.4 Project Alternatives

Three alternatives to the proposed project are considered. These alternatives were examined and detailed in the FED, 1998, and reexamined as they apply to this

FSED. Two of these alternatives take the form of additional changes to the existing regulations that could feasibly be joined. The third alternative is a no project (no fishery) alternative. In evaluating alternatives, the comparative merits and impacts of individual alternatives that could be logically and feasibly joined should be considered as so joined unless otherwise stated. The alternatives to be considered under this FSED are:

- ∉ Alternative 1 (no project, i.e. no fishery, alternative). Under this alternative, the commercial harvest of herring would be prohibited.
- ∉ Alternative 2 (existing regulations). Under this alternative, existing regulations would be modified only by adjusting quotas to reflect current biomass estimates and by adjusting dates to reflect changes in the calendar.
- ∉ Alternative 3 (individual vessel quota for gill net vessels in herring roe fishery). Under this alternative the proposed regulations would be modified by establishing an individual vessel quota for all gill net vessels. The proposed individual gill net vessel quota would equal the overall gill net quota divided by the number of permittees using gill net gear.

The following section states the specific purpose of the alternatives and summarizes the factual basis for determining that the alternatives are reasonably necessary.

2.4.1 Alternative 1 (no project)

This is a CEQA required alternative. It provides a reference for comparison to the proposed project and alternatives 2 and 3.

2.4.2 Alternative 2 (existing regulations)

The existing regulations for the commercial herring fishery are for the 2003-04 season. This alternative would apply those 2003-04 season regulations to the 2004-05 season, with changes in the quotas to reflect current biomass estimates and changes in season dates to reflect annual changes in the calendar. None of the

other amendments to the regulations contained in the proposed project would be considered.

2.4.3 Alternative 3 (individual vessel quota)

This alternative would establish an individual herring quota for each San Francisco Bay gill net permittee. Under existing regulations [Section 163(g)(4)(C), Title 14, CCR] an overall herring quota is established for each of the three gill net groups (platoons) in San Francisco Bay, allowing individual permittees to take and land as much fish (tonnage) as they are capable of until the overall quota for their respective group is reached. An individual permit quota has been suggested each season for the past several years. However, there has never been a clear consensus of support or opposition among industry members about this issue. The Department is concerned about the level of enforcement effort that would be necessary to effectively monitor and enforce this alternative. See Section 2.4.3 of the FED for a full description of this alternative.